

Bibliometric Analysis of Sustainable Cross-Border Logistics - a Cybersecurity Awareness Framework

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Abstract

Fostering a culture of cybersecurity awareness is at the nexus of European sustainable cross-border logistic in terms of achieving the level of commercial competition according to the trend path of trade development. Digitization has played a key role in the development of new directions for product sales and submission in the movement of services and value, as well as in tailoring new possibilities for the delivery and logistic return of products from warehouses to cross-docking units, to outlet stores, as well as directly to the end customers. This paper is a bibliometric analysis of sustainable cross-border logistics. In this analysis it was used Web of Science Database, for the years 1997 – 2024 and it is focused on evolution over time of research, keyword analysis, co-occurrence analysis, geographical spread, most cited articles, between others.

Keywords: *cross-border logistics, bibliometric analysis, research articles, sustainability, innovation*

JEL classification: M150, Q580, P450

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1. Introduction

Relevant studies for NIST Cybersecurity Supply Chain Risk Management (C-SCRM) (Boyens et al., 2022) put under the magnifying glass that digital European cross-border collaboration involves also identifying, assessing, and mitigating the risks associated with the distributed and interconnected nature of product and service supply chains. Similar European requirements and issues of commercial and social sustainable survival, have extrapolated that data privacy managements can mitigate the risk of data breach (Kikuchi et al., 2022), risks that arose individually and concretely in certain areas of a country at the level of the entire country risks that arose at the level of the continents as well as risks that

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affected certain commercial and socio-geographical parts at the global level, risks that were in a latent state ready to occur , new risks, without precedent and experience in being solved, risks that had no professionals with the expertise to know how to solve them and prevent them.

The main objective of this article is to carry out a bibliometric analysis of sustainable cross-border logistics and identify the linkages between the key terms. Therefore, first the theoretical background will be evaluated, methodology details will be set and data will be collected from the Web of Science database, after that the findings will be illustrated.

2. Literature review

In contouring cybersecurity awareness framework among European countries, the use of personal data as well as the storage of personal data have been the subject of very extensive discussions and studies to keep them in a secure and safe environment for proper use and away from cyber-attacks arising from an irresponsible manner of accessing. According to studies developed by experts in the field (Kinnunen, 2022) cloud computing has shifted the paradigm from developing enterprise software to acquiring it as a service. Because software that has been tested at multiple risk levels has been found to be much more secure than software that is built from scratch without the experience and testing in a real environment.

Analyzing several specialized studies in the field, it can be summarized that European cross-border collaboration has been very concerned with securing data and creating a safe environment in which to grow in an organic manner not forced by a hostile environment. With the growth of cyber-terrorism, enterprises worldwide have been struggling to stop intruders from obtaining private data (Ferreira et al., 2023). Along with road transportation, sea shipping and air shipping, a very large amount of personal and financial data is also transferred, as real-world concerns are driving actual cybersecurity investment for decision-making (Shaikh & Siponen, 2023).

The needs of the final consumers make the goods to be transferred autonomously by national transports, intra-community transports or extra-community transports, basically the needs of customers can be met both by road transport, rail transport, sea transport and air transport, all in a context supported by data transfer (Haydam et al., 2015) which contain: official supplier data, official buyer data, official product data, end user details, real-time GPS location of the goods route, location of equipment in time, as well as economic data regarding the movement of people, goods and services over a period of time.

At all European countries level, this large volume of data requires a constant and permanent analysis of the storage systems of this data and the passwords as well as the rights of use and access by certain persons to this very large volume of data. Specialized studies in this field highlight the fact that experts in the field developed a Cybersecurity Audit Index (Slapnicar et al., 2022) composed for risk prevention reasons of three dimensions - planning, performing and reporting, because the audit

within a company can show both the vulnerabilities and the parts that need to be improved by introducing the use of equipment with an internet of things (IoT) usage. As a result, electronic logistics monitoring systems have evolved both for proper use in a digital environment and to cope with human resources being educated for cyber security and also to support the different logistics costs generated by European cross border logistic activities and requirements.

From this point of view the SMEs tend to monetize the risks, with as low costs as possible to ensure competitive costs at the market level. Experts even reiterate that organizations use the SCRM model: risk identification and assessment, risk analysis, environmental monitoring, and risk management (Aljabhan, 2023) for reasons related to the final cost of the product and data they use in their daily activities.

Experts in the field have been concerned with this aspect and have developed a Cyber Incident Handling Modelling Language (CIHML) that focuses explicitly on modelling incident handling in the context of a critical information infrastructure (Mouratidis et al., 2023) as cyber security incidents are now prevalent in many organisations (Patterson et al., 2023). Expertise studies in the European field of Logistics, took into account the experiences of several institutions and companies, according to the above noted, and as a result of the similarities they concluded that increased adoption of security controls does in fact reduce the likelihood of being breached (Gandal et al., 2023). Cybersecurity awareness framework arose thus, by considering the need for institutional and individual collaboration in a safe, secure and sustainable environment.

3. Methodology and data analysis

The framework of bibliometric research will be done by following the steps study purpose, data gathering, visualization analysis and outcome interpretation.

Methodological Framework Web of Science Database

Table 1

Keywords	sustainable cross-border logistic
Search filters	title, abstract, key terms of the papers
Research type	article, proceeding paper, review article
Period	1997 - 2024
Number of analysed documents	71
Analysis type	evolution of research over time, geographical spread, most cited articles, affiliation, categories, keyword analysis, co-occurrence analysis
Database	Web of Science
Software	VosViewer 1.6.20 (Van Eck & Waltman 2023)

Source: authors, using Web of Science Database

Data was gathered from Web of Science Database, a recognized and developed multidisciplinary academical database with high standards and peer reviewed papers (Barbu & Nicolescu, 2024), creating a valuable database applicable to bibliometric review (Camara, 2024). Using the keywords sustainable cross-border logistic, filtered by title, abstract and key terms of the paper, over the years 1997 – 2024 were found a number of 71 articles, proceeding papers and review articles. Data was analysed using Vos Viewer 1.6.20 (Van Eck & Waltman 2023), resulting into keyword analysis and co-occurrence analysis illustrations between other.

Evolution of research in the last years of analysis of sustainable cross-border logistic is characterized by an overall increase trend with periods of steep decline, which took place in 2016, 2018 and 2020. Even if the year 2024 registered a slight decrease from the previous 2 years, it can be seen that the last 4 years the research in sustainable cross-border logistic records the maximum number in term of number of papers.

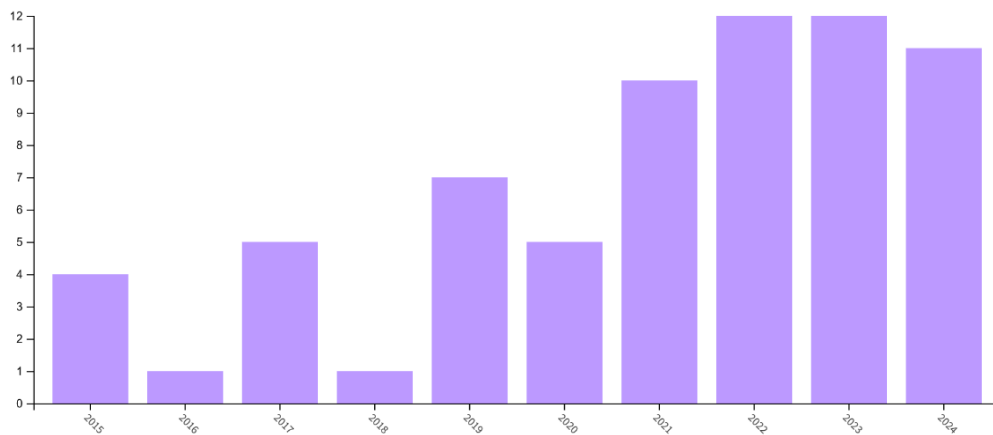


Figure 1. Evolution of research in the last 10 years of analysis

Source: Web of Science database analysis tool

In the figure 2 there are presented the 10 first countries worldwide in term of number of publications in the field. Therefore, the countries with the most interest in the field of sustainable cross-border logistic are Australia and Canada at the top, followed by Brazil, Finland, England, France and Bulgaria, Colombia, Czech Republic, Estonia, with 6 out of 10 countries from Europe.



Figure 2. Geographical spread of countries
 Source: Web of Science database analysis tool

Top 10 most cited articles

Table 2

Rank	Number of citations	Authors	Paper name	Journal
1	235	Khan, S.A.R. et al., (2021)	Industry 4.0 and circular economy practices: A new era business strategy for environmental sustainability	Business Strategy and the Environment
2	76	Khan, S.A.R., Yu, Z. and Sharif, A., (2021)	No Silver Bullet for De-carbonization: Preparing for Tomorrow, Today	Resources Policy
3	57	Roodposhti, M.S., Aryal, J. and Bryan, B.A., (2019)	A novel algorithm for calculating transition potential in cellular automata models of land-use/cover change	Environmental Modelling & Software
4	53	Cao, Y.F. and Shen, B., (2022)	Adopting blockchain technology to block less sustainable products? entry in global trade	Transportation Research Part E-Logistics and Transportation Review
5	34	Tolstoy, D., Nordman, E.R. and Vu, U., (2022)	The indirect effect of online marketing capabilities on the international performance of e-commerce SMEs	International Business Review

Rank	Number of citations	Authors	Paper name	Journal
6	23	Cano, J.A., Londoño-Pineda, A. and Rodas, C., (2022)	Sustainable Logistics for E-Commerce: A Literature Review and Bibliometric Analysis	Sustainability
7	22	Nahon, A, et al., (2019)	Corridor Mapping of Sandy Coastal Foredunes with UAS Photogrammetry and Mobile Laser Scanning	Remote Sensing
8	18	He, Y.G., Wu, R.H. and Choi, Y. J., (2021)	International Logistics and Cross-Border E-Commerce Trade: Who Matters Whom?	Sustainability
9	17	Guan, S., (2021)	Smart E-commerce logistics construction model based on big data analytics	Journal of Intelligent & Fuzzy Systems
10	17	Schiebel, J., Omrani, H. and Gerber, P., (2015)	Border effects on the travel mode choice of resident and cross-border workers in Luxembourg	European Journal of Transport and Infrastructure Research

Source: authors, using Web of Science database citation analysis tool

In table 2 are presented the details of top 10 most cited papers from the field. All of them are published in different journals and linked with Web of Sciences database. There is a big difference in term of number of citations between the first position and the second one, the first rank registered a number of 235 citation and the second one a number of 76 of citations. The first paper represents 42,57% of analysed articles, taking into consideration the total citation of the top 10 which is 552 citations. Author Khan, S.A.R is present in the first two positions of the rank, making remarkable contributions in the field.

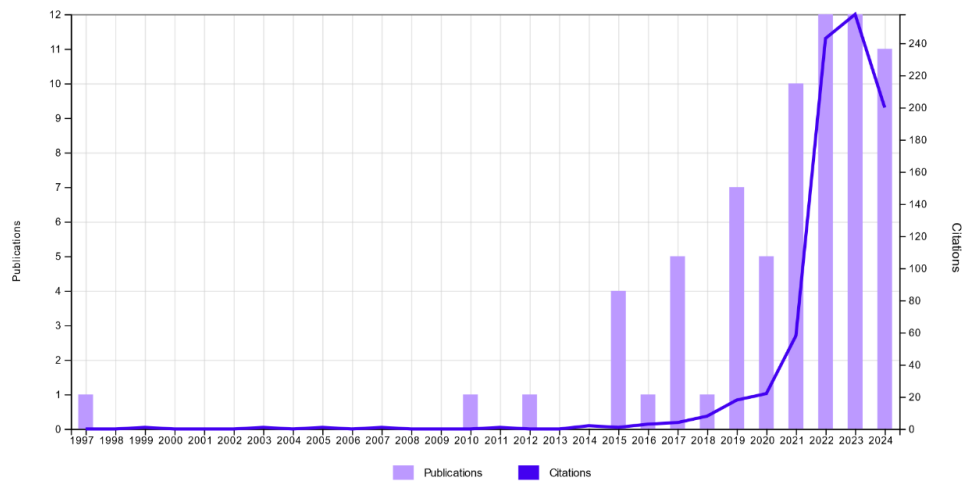


Figure 3. Citation trend

Source: Web of Science database analysis tool

In the figure 3 it is presented the trend with reference to the number of citations in the analysed period, 1997-2024. In the last 10 years the trend is ascendent, with its peak in 2022 and 2023.



Figure 4. Affiliation

Source: Web of Science database analysis tool

In the figure 4 are highlighted the institutions with relevant contributions in the field of sustainable cross-border logistic, such as: Chanh An University, Birmingham City University and Bucharest University of Economic Studies, between others.



Figure 5. Categories

Source: Web of Science database analysis tool

Sustainable cross-border logistic topic is analyzed in diverse areas of interest, such as environmental studies, green sustainable science technology, environmental sciences, management, economics, transportation, business, transportation science technology, engineering civil, computer science interdisciplinary applications. In figure 5 are emphasized the first 10 categories from the field of study.

In term of journal, the first 10 publications are the following: Elsevier, Atlantis Press, Hindawi Publishing Group, Emerald Group Publishing, Association for Computing Machinery, Chernihiv National University of Technology, Crc Press-Balkema, Editorial Board Ejtir (European Journal of Transport and Infrastructure Research), Editura ASE, IEEE.

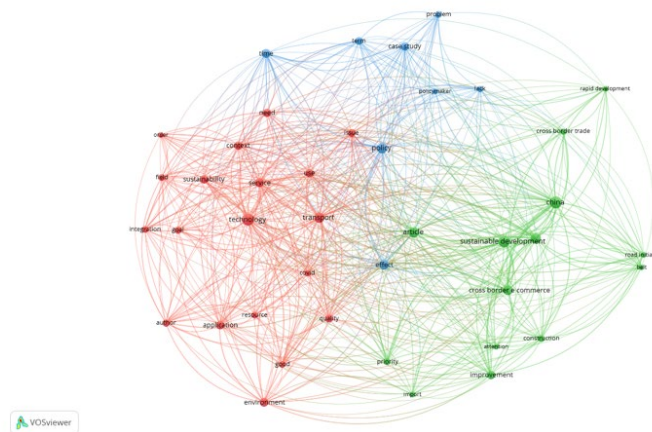


Figure 6. Keyword map

Source: authors using Vos Viewer program (Van Eck & Waltman, 2023)

In order to create keyword map in Vos Viewer were followed the stages: create a map based on text data (Bunea, 2021), from Web of Science database documents, selecting both title and abstract fields. Keyword map of sustainable cross-border logistic has 3 clusters, emphasised in the three different colours. The green cluster with main keywords such as article, priority, import, improvement, construction, attention, cross-border e-commerce, sustainable development, China, cross border trade, rapid development, road initiative, belt. It explains the importance of sustainability for logistics at all levels, its efficiency and reliability. Red cluster has main keywords such as environment, good, quality, covid, resource, application, author, integration, goal, technology, field, service, sustainability, transport, use, need, context, issue, order. This focuses on the integration of all types of resources needed for sustainable cross-border logistic. And the blue cluster has the following keywords: effect, policy, policymaker, lack, time, term, problem, case study, which focuses on the outcomes of sustainable cross-border logistic.



Figure 7. Co-occurrence map

Source: authors using Vos Viewer program (Van Eck & Waltman, 2023)

In the above co-occurrence map, there are shown 2 clusters and the relationships between the frequency of appearance of two terms in the same paper. Its objective is to identify the linkage, theme or trend of the dataset. In the green cluster there are keywords such as sustainable development, performance, cross boarder e-commerce and China. Here it is reflected the trend where sustainability is prioritized in the growing sector of cross-border e-commerce, focusing on environmentally, socially and governmentally conscious ecosystem. In the red

cluster, keywords such as impact, innovation, logistics, management and supply chain management, draws attention to the role of innovation for sustainability and efficiency in the field of logistics.

4. Conclusions

Given that digitization remained the only way to keep moving goods and services, it was also necessary to develop a new capacity to ensure the risks that may occur during digital use, both protecting the user and financial data such as credit card details online payment as well as the maintenance of personal data on the sites that consumers access in a safe and secure manner. The bibliometric analysis shows that in 2022 and 2023 were published the highest number of articles, with main contributors from Australia and Canada. Author Khan, S.A.R. is at the top of the rank, together with his teams occupies the first two positions, and has the highest number of citations, respectively 311. Main areas of interest are environmental studies and sciences, management and economics. After evaluation the keywords and co-occurrence maps, resulted from usage of VosViewer, were highlighted new dimensions of sustainable cross-border logistic, respectively importance of sustainability for logistics, integration of all types of resources and outcomes, using innovation for efficiency and reliability.

This study is a both quantitative and qualitative research, mixing the analysis of literature review from the field and bibliometric methods in order to evaluate the topic of sustainable cross-border logistics. Main bibliometric methods used in the paper are keyword analysis, co-occurrence analysis, categories, evolution of research over time and most cited scientific articles. This article can benefit researchers, students and organizations from the logistics sector and can be further developed by adding statistical analysis to the ones already used.

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